DOCUMENT RESUME

ED 410 512 CG 027 999

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TITLE Diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) in Childhood: A Review of the Literature.
PUB DATE 1997-04-00
NOTE 16p.; Paper presented at the Annual Meeting of the National Association of School Psychologists (Anaheim, CA, April 2-5, 1997).
PUB TYPE Information Analyses (070) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Attention Deficit Disorders; *Clinical Diagnosis; Diagnostic Tests; Elementary Secondary Education; Evaluation Methods; Hyperactivity; Literature Reviews; *Symptoms (Individual Disorders)

ABSTRACT

While it is acknowledged that there is no flawless measure of attention deficit/hyperactivity disorder (ADHD) in childhood, a review of the literature reveals significant agreement in recommended assessment procedures. An overview of these procedures is presented in this paper. It begins with the diagnostic criteria for ADHD, such as symptom duration, inattention, hyperactivity, impulsivity, developmental level, symptom onset, symptoms appearing in multiple settings, clinical significance, and the ruling out of other disorders that might cause the symptoms. The paper then discusses procedures recommended in a sample of the literature that discuss ADHD diagnosis, including diagnostic procedures, rating scales, interviews, parent interviews, direct observation, laboratory and psycho-educational tests, medical evaluation, a review of school records, and peer assessments. It was found that rating scales, interviews, observations, and laboratory/psycho-educational testing were the most frequently recommended diagnostic techniques, although the efficacy of some of these techniques is questionable. It is emphasized that the diagnosis of ADHD is a matter of an educated opinion and that no single psychological or medical test is recommended for use in diagnosing ADHD. Furthermore, a number of other factors or conditions can create ADHD-like symptoms. Ccntains 48 references. (RJM)

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Diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) in Childhood: A Review of the Literature

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Abstract

From a review of the recent literature this article discusses the process of diagnosing Attention-deficit/Hyperactivity Disorder (ADHD) in children. First, the article discusses diagnostic issues generated by the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). Then it presents procedures recommended in a sample of publications that discuss ADHD diagnosis. Results of this literature review found rating scales, interviews, observations and laboratory/psycho-educational testing to be the most frequently recommended diagnostic techniques. Other less frequently recommended procedures were medical evaluations, peer assessments, and reviews of school records.

Because there is no single procedure that will reliably diagnose ADHD (Lin-Dyken & Wolraich, 1991; Morriss, 1992, March/April), diagnosis is a complex process (Anastopoulos & Barkley, 1992). Further complicating matters are the variety of other disorders that can co-exist with and/or cause ADHD-like symptoms (Barkley, 1990; Schaughency & Rothlind, 1991; Swanson, 1992). As a result, this diagnosis is a time consuming process ideally involving multiple diagnostic procedures (Anastopoulos & Barkley, 1992; Atkins & Pelham, 1991; Barkley, 1990, 1991; Guevremont, DuPaul, & Barkley, 1990; Landau & Burcham, 1996; Schaughency & Rothlind, 1991), conducted by several different specialists (Swanson, 1992), obtaining information from multiple sources (Barkley, 1991; Guevremont, DuPaul, & Barkley, 1990; Landau & Burcham, 1996; Schaughency & Rothlind, 1991).

While it is acknowledged that there is no flawless measure of ADHD (Atkins & Pelham, 1991) a review of the literature has found significant agreement in recommended assessment procedures. This article will review these procedures. Before doing so, however, it begins with a discussion of the American Psychiatric Association's (1994) ADHD diagnostic criteria.

ADHD Diagnostic Criteria

ADHD is a diagnostic category found in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM IV) published by the American Psychiatric Association (1994). In *DSM IV* ADHD is placed within the subclass of "Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence" (pp. 37-121) known as "Attention-Deficit and Disruptive Behavior Disorders" (pp. 78-94). Along with ADHD, this subclass includes Conduct Disorder and Oppositional Defiant Disorder.

According to DSM IV, the primary symptoms of ADHD are developmentally inappropriate degrees of inattention, impulsiveness, and hyperactivity. Using *DSM IV* criteria (Table 1) a child can be diagnosed as Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive, Predominantly Hyperactive-Impulsive or Combined types. Diagnostic criteria for the Predominantly Inattentive Type require that six or more of the nine symptoms of inattention be present. Criteria for the Predominantly Hyperactive-Impulsive Type require that four or more of the six symptoms of hyperactivity and impulsivity be present. Criteria for the Combined Type require that both Inattentive and Hyperactive-Impulsive criteria be met[2]. Although the specific behavioral symptoms presented by *DSM IV* are self explanatory, other diagnostic requirements deserve further elaboration.

Symptom duration. First, the criterion behaviors must "have persisted for at least 6 months . . ." (American Psychiatric Association, 1994, p. 84). It has been suggested that strict adherence to this requirement is especially critical when assessing preschoolers. Up to 40% of this population is rated as inattentive and overactive by their parents. However, in the majority of these cases concerns remit within three to six months. In other words, significant inattention and hyperactivity in the three to four-year-old is not necessarily indicative of a persistent pattern of ADHD (Barkley, 1990).

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[1] The author would like to thank Carolyn Fisher and Bev Gabrielson for their helpful comments on earlier drafts of this paper.

[2] The use of these fixed cut-off scores, generates a diagnostic issue that needs to be mentioned. It has been argued that a fixed score fails to take into account developmental differences. As younger children are frequently viewed as having short attention spans and as being hyperactive, use of the single criterion scores for all age groups may tend to over identify young children. Conversely, it may be too exclusive when applied to older age groups (Barkley, 1990).

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Table 1
DSM IV Criteria for Attention-Deficit/Hyperactivity Disorder

A. Either (1) or (2):

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
(b) often has difficulty sustaining attention to tasks or play activities
(c) often does not seem to listen when spoken to directly
(d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
(e) often has difficulty organizing tasks and activities
(f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
(g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
(h) is often easily distracted by extraneous stimuli
(i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected
(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
(d) often has difficulty playing or engaging in leisure activities quietly
(e) is often "on the go" or often acts as if "driven by a motor"
(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed
(h) often has difficulty awaiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by an other mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Note. From the American Psychiatric Association (1994, pp. 83-85).

Developmental level. Second, it is important to note that the diagnostic criteria also begin by specifying that a behavioral criterion is considered to be met only if the behavior is ". . . inconsistent with developmental level" (American Psychiatric Association, 1994, p. 83). According to *DSM IV*:

> *Symptoms of inattention are common among children with low IQ who are placed in academic settings that are inappropriate to their intellectual ability. These behaviors must be distinguished from similar signs in children with Attention-Deficit/Hyperactivity Disorder. In children with Mental Retardation, an additional diagnosis of Attention-Deficit/Hyperactivity Disorder should be made only if the symptoms of inattention of hyperactivity are excessive for the child's mental age* (pp. 82-83).

This means, for example, that if a delayed 12-year-old with a mental age of six-years displays a criterion behavior in a manner typical of a six-year-old, it would not meet *DSM IV* criteria for ADHD. However, if the same child displays criterion behaviors in a manner that is typical of a three-year-old, it would meet *DSM IV* criteria.

Symptom onset. Third, symptom onset must be before the age of seven. *DSM IV* states: "Most parents first observe excessive motor activity when the children are toddlers, frequently coinciding with the development of independent locomotion" (American Psychiatric Association, 1994, p. 82). It is possible that a neurologically comprising event, such as a head trauma or hypoxic injury, may cause ADHD after age seven (Barkley, 1990; Pennington, 1991). Typically, however, if symptom onset is after this age, they are usually caused by something other than ADHD (e.g., substance abuse, learning disabilities, physical illness, etc.) (Pennington, 1991). However, the symptom onset requirement does not mean that the diagnosis must be made before the age of seven. It can even be made in adulthood if the diagnostician is able to verify that some symptoms were present before the cut-off age.

Multiple settings. Fourth, the problematic symptoms must be present in two or more settings. According to *DSM IV*: "Behavioral manifestations usually appear in multiple contexts including home, school, work, and social situations" (American Psychiatric Association, 1994, p. 79). Thus, for the diagnosis to be made, information should be gathered from two or more different sources and/or settings (e.g., parents and teachers and/or home and school). If the symptoms are only present in one setting then alternative explanations for symptoms must be considered. For example, the presence of a specific learning disability may result in symptoms of ADHD at school, but not in other settings.

Clinical significance. Fifth, *DSM IV* specifies: "There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning" (American Psychiatric Association, 1994, p. 84). Thus, for this diagnosis to be made there must be documentation of the adverse effects of ADHD symptoms. This means, for example, that if an inattentive and hyperactive primary grade child is able to obtain passing grades, follow class and playground rules, and to have appropriate peer relationships, there would be reason to question the application of the ADHD diagnosis.

Differential diagnosis. Finally, the differential diagnosis of this disorder requires that age-appropriate behaviors in active children, Mental Retardation, understimulating environments, oppositional behavior, and other mental disorders including Pervasive Developmental Disorders, Psychotic Disorder, and Other Substance-Related Disorder Not Otherwise Specified be considered and ruled out as primary causes of the observed symptoms before making the diagnosis of ADHD. This requirement points to the fact that a variety of conditions may cause ADHD-like symptoms and that a proper diagnostic procedure must include techniques designed to consider alternative explanations for these symptoms.

Summary. From this discussion of *DSM IV* criteria, the need for several different diagnostic procedures should be apparent. For example, to determine developmental appropriateness of behavior it will be necessary to determine the child's mental age. This may require the use of an intelligence test. Additionally, to document that the age of onset was before the age of seven, and that clinical significance and duration requirements have been met, school record review and/or parent and teacher interviews will be needed. Also, to ensure that behaviors are displayed in multiple settings, direct observation may be appropriate. Specific recommended diagnostic procedures such as these will now be discussed.

Components of the ADHD Diagnosis

Diagnostic Procedures

A sample of the literature addressing ADHD diagnosis has found that a variety of different procedures are used. However, most can be classified into one of several procedural categories. The four most frequently recommended procedures are rating scales, interviews, observations, and laboratory and psycho-educational testing. Thus, these procedures will be discussed first. This will be followed by a discussion of the other recommended procedures: medical evaluation, school record review, and peer assessment. For a summary of the sources that advocate the use of each procedure the reader is referred to Table 2. A summary of diagnostic procedures, including an overview of possible diagnostic techniques and questions, is provided in Table 3.

Rating scales. Rating scales are the most widely advocated procedure for evaluating children with ADHD (Hinshaw, 1994). All sources reviewed for this paper cite rating scales as being an essential part of the ADHD diagnosis (see Table 2 for references). For example, Hinshaw (1994) states: ". . . rating scales are an indispensable element of the assessment of children with suspected attention deficits and hyperactivity" (p. 32). They have been proven to effectively differentiate children with ADHD from those without this disorder (Barkley, 1990) and, relative to other diagnostic procedures, are quick and cost effective measures (Guevremont, DuPaul, & Barkley, 1990; Parker, 1992; Schaughency & Rothlind, 1991).[3]

Suggested purposes of rating scales include helping to document the presence of ADHD symptoms and providing a normative frame of reference. They allow the diagnostician to assess how deviant the child's behavior is relative to age peers (Anastopoulos & Barkley, 1992; Landau & Burcham, 1996; Parker, 1992; Schaughency & Rothlind, 1991; Silver, 1990). Additionally, rating scales provide information used in assessing treatment effectiveness (Barkley, 1990; Guevremont, DuPaul, & Barkley, 1990; Landau & Burcham, 1996).

Rating scales are typically administered, scored and interpreted by mental health professionals. Because they are sensitive to the setting of the rater, it is recommended that as many people as possible provide these data. In this way the diagnostician can determine where ADHD symptoms are most problematic. It is also suggested that a rater have known the child being rated for at least six weeks (Landau & Burcham, 1996).

Besides measures designed to assess symptom severity and treatment effectiveness [e.g., Conners' (1969) Teacher Rating Scale], it is also recommended that omnibus rating scales be employed (DuPaul, 1992). Measures such as the Child Behavior Check List (Achenbach & Edelbrock, 1983) are helpful in identifying comorbid conditions (Landau & Burcham, 1996) and assist in the generation of alternative hypotheses for ADHD-like symptoms.

As with all other ADHD diagnostic procedures, and despite their proven effectiveness, it is not recommended that rating scales be used by themselves. Morriss (1991, March/April) makes this point when he states: "An attention disorder cannot be diagnosed solely on the basis of a rating scale. There is no rating scale that can be used as a 'test' for ADD" (p. 15). He goes on to point out that when used in this way rating scales lead to many false positives. Also, Lin-Dyken and Wolraich (1992) point out that when used alone ". . . the sample of children selected will generally include many of those who have aggressive conduct disorder and not just those children with ADHD" (p. 175). Other concerns expressed regarding rating scales include the possibility of rater bias (Atkins & Pelham, 1991; DuPaul, 1992; Parker, 1992), and unrepresentative normative samples in some scales (Hinshaw, 1994).

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[3] For a more complete review of specific rating scales the reader is encouraged to refer to Barkley (1990) and Goldstein and Goldstein (1990b).

Table 2
Techniques Recommended by Discussions of ADHD Diagnosis

Author(s)	RS	INT	DO	Test	MedEv	SchRec	PRate
Landau & Burcham (1996)[a,b]	√	√	√	√			
Hinshaw (1994)	√	√	√	√			√
Anastopoulos & Barkley (1992)[c]	√	√	√	√			
August, Ostrander, & Blommquist (1992)[d]	√	√					
DuPaul (1992)[a,e]	√	√	√			√	
Lin-Dyken & Wolraich (1992)	√	√		√	√		
Morriss (1992, March/April)[a]	√	√	√	√		√	
Parker (1992)[a]	√	√	√	√	√		
Silver (1992)[c]	√	√	√				
Swanson (1992)[a]	√	√	√	√	√		
Atkins & Pelham (1991)[a,b]	√		√			√	√
Barkley (1991)[c]	√	√	√	√			
Pennington (1991)	√	√	√	√			
Schaughency & Rothlind (1991)[f]	√	√	√	√			√
Barkley (1990)[c]	√	√	√	√	√		
Goldstein & Goldstein (1990b)	√	√	√	√	√	√	
Guevremont, DuPaul, & Barkley (1990)[c]	√	√	√	√			
Blondis, Accardo, & Snow (1989)[c]	√	√		√	√		
Wender (1988)[c]	√	√		√			
Kirby & Grimley (1986)	√	√		√			
Silver & Brunsletter (1986)[c]	√	√	√				
Totals	100%	95%	76%	76%	29%	19%	14%

Note. RS = Rating scales, INT = Parent, teacher and child interviews, DO = Direct observation, Test = Laboratory and psycho-educational testing, MedEv = Medical evaluation, SchRec = School records, PRate = peer ratings.

[a]Provides recommendations for school-based assessments of ADHD.
[b]Describes procedures to define functional deficits important to treatment planning.
[c]Provides recommendations for clinical assessments of ADHD.
[d]Provides recommendations for epidemiological screening of ADHD.
[e]Also recommend assessing desk organization and quantity of written work.
[f]Do not recommend laboratory assessment of attention skills, but suggests psycho-educational testing may be necessary to rule out alternative explanations for ADHD symptoms.

Table 3
Summary of Recommended ADHD Diagnostic Procedures

Procedural Category	Diagnostician(s)	Possible Diagnostic Techniques	Possible Diagnostic Questions
Rating scales	• Mental Health Professional • Medical Professional	• Conners' (1969) *Teacher Rating Scale*. • *Child Behavior Check List* (Achenbach & Edelbrock, 1983).	• Are ADHD symptoms present? • How deviant are symptoms from the norm? • In what settings are ADHD symptoms most problematic? • Are there alternative or comorbid conditions?
Parent, Teacher, and Child Interviews	• Mental Health Professional • Medical Professional	• Structured interview techniques [e.g., *Diagnostic Interview Schedule for Children* (Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982)]. • Unstructured interview techniques. • Semi-structured interviews (i.e., developmental and health histories).	• Are ADHD symptoms present? • When was the onset of ADHD symptoms? • How long have symptoms been present? • Is the environment a factor? • Is there a family history of ADHD? • Is the developmental/medical history suggestive of ADHD? • Are there learning difficulties? • Are there interpersonal difficulties?
Direct Observations	• Mental Health Professional • Educational Specialist	• Observation of test taking behavior. • *Classroom Observation Code* (Abikoff, Gittleman-Klein & Klein, 1977). • *Restricted Academic Situation* (Barkley, 1990).	• Does the child display ADHD symptoms? • Does the child display interpersonal and/or social skill deficits?
Laboratory and Psycho-Educational Testing	• Mental Health Professional	• *Continuous Performance Tests* (e.g., Gordon, 1983). • Intelligence testing (e.g. Wechsler, 1991). • Achievement testing. • Perceptual processing measures.	• Does the child perform poorly on measures of attention? • What is the child's ability level? • Are there learning disabilities? • Are there alternative or comorbid conditions?
Medical Evaluation	• Pediatrician • General Practitioner • Psychiatrist	• Medical interview. • Physical examination. • Other medical tests as indicated (e.g., EEG).	• Are symptoms secondary to a medical condition? • Are symptoms secondary to a treatable medical condition? • Are symptoms related to treatments for other medical conditions? • Is medication contraindicated?
School Records	• Mental Health Professional • Educational Specialist	• Cumulative file review. • School work sample review.	• Is there a history of ADHD symptoms? • When was the onset of ADHD symptoms? • How severe are the ADHD symptoms?
Peer Ratings	• Mental Health Professional • Educational Specialist	• Peer nominations. • Peer ratings [e.g., *Pupil Evaluation Inventory* (Pekarick, Prinz, Liebert, Weintraub & Neale, 1976)]. • Lowest play rating (Asher & Dodge, 1986).	• Is the child accepted or rejected by peers?

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Interviews. The second most frequently recommended ADHD diagnostic procedure are interviews (see Table 2 for references). Typically conducted by a mental health or medical professional, interviews may obtain data from parents, teachers, and children themselves. According to Hinshaw (1994), Parker (1992), and Pennington (1991) interviews address a number of diagnostic questions including the following:

(1) Are ADHD symptoms present?
(2) When was the onset of ADHD symptoms?
(3) How long have symptoms been present?
(4) Is the environment a factor?
(5) Is there a family history of ADHD?
(6) Is the developmental history suggestive of ADHD?
(7) Are there learning difficulties?
(8) Are there interpersonal difficulties?

Recommended interview formats include both structured and unstructured procedures. The advantage of structured formats is that they allow for normative comparisons (Anastopoulos & Barkley, 1992) and are sensitive to detecting ADHD (Schaughency & Rothlind, 1991). Hinshaw (1994) states: "... structured interviews are particularly helpful for ascertaining a definitive diagnosis of ADHD" (p. 34). At the same time, however, they are cumbersome to use (Anastopoulos & Barkley, 1992) and are of limited value in designing school based interventions (Landau & Burcham, 1996). Also, when used alone they may result in false positives (Schaughency & Rothlind, 1991).[4] The advantage of unstructured formats are their flexibility, focus on the interviewee's concerns, and the wealth of psychosocial data that they provide. On the other hand, they are unreliable in diagnosing ADHD (Anastopoulos & Barkley, 1992; Hinshaw, 1994; Schaughency & Rothlind, 1991).

Parent interviews are suggested to be an indispensable part of an ADHD evaluation (Barkley, 1990; Landau & Burcham, 1996; Parker, 1992). They are described by Whalen and Henker (1980) as ". . . a rich and often untapped source about atypical child development and family coping strategies" (p. 348). No adult is likely to have more information regarding a child's functioning than his or her parents. At the same time, however, it is acknowledged that the parent interview can be unreliable (Guevremont, DuPaul, & Barkley, 1990). Besides documenting ADHD symptoms, semi-structured parent interviews are reported to be helpful in assessing the child's developmental and school history (Barkley, 1990, 1991; Guevremont, DuPaul, & Barkley, 1990; Hinshaw, 1994). It is suggested that the child's history should include symptoms of ADHD from an early age, and a family history of ADHD (DuPaul, 1992; Guevremont, DuPaul, & Barkley, 1990; Pennington, 1991). Regarding semi-structured interview procedures Hinshaw (1994) states:

> *". . . if there were to be only one assessment tool that could be used to evaluate the child who potentially has ADHD, a thorough developmental and family history might well be the choice, given its potential richness, its coverage of associated symptom features, its provision of information regarding crucial contextual factors, and its ability to rule in or rule out a host of potential risk factors and causal agents (pp. 35-36).*

Of almost equal importance is the *teacher interview*. In fact, Swanson (1992) recommends that in the case of conflicting opinions, special consideration should be given to teacher reports. Teachers are suggested to be an especially valuable resource given their knowledge of age appropriate behavior, and their access to observations of learning and social behavior (Wender, 1988). Besides documenting ADHD symptoms, the teacher interview is also helpful in identifying antecedents and consequences of problem behaviors (DuPaul, 1992), and in providing information regarding the child's academic functioning (Barkley, 1991; Guevremont, DuPaul, & Barkley, 1990). While it has been recommended that the ADHD diagnosis not be made without these reports (Liedel, 1987), they are reported to not be a well utilized resource (Parker, 1992). Also, it has been suggested that the diagnosis of ADHD in a clinic setting can be made without these reports. This suggestion comes from the observation that if a parent report is positive

[4] The reader is encouraged to refer to Barkley (1990) for a review of structured procedures.

for ADHD, there is a 90% probability that the teacher report will also be positive (Biederman, Keenan & Faraone, 1990).

Finally, a *child interview* has also been suggested to be useful in diagnosing ADHD. While this perspective will provide useful information, child self-reports may not be helpful in documenting ADHD symptoms (Hinshaw, 1994; Landau & Burcham, 1996). In this regard, parent and teacher interview data are more valid and reliable. However, the child interview can be important in determining the presence of other psychopathology such as depression and psychosis (Goldstein & Goldstein, 1990b; Wender, 1988). Also, behavior observed during the interview may be diagnostically significant. However, because the interview setting is likely to be novel, the absence of ADHD symptoms during the interview should not by itself be used to rule out ADHD (Guevremont, DuPaul, & Barkley, 1990).

Direct Observation. Typically conducted by either mental health or educational professionals, observations are designed to confirm reports (obtained by interview and rating scale) of ADHD symptoms (Parker, 1992), as well as to assess interpersonal and social skills (Hinshaw, 1994). Although acknowledged to be one of the most costly assessment procedures (Atkins & Pelham, 1991; Guevremont, DuPaul & Barkley, 1990; Schaughency & Rothlind, 1991) most sources reviewed recommend using direct observation when diagnosing ADHD (see Table 2 for references). According to Anastopoulos and Barkley (1992), ". . . such procedures are often more reliable and valid than clinic-based laboratory assessment devices" (p. 422). They are able to define specific behaviors without the subjectivity of rating scales (Atkins & Pelham, 1991; Schaughency & Rothlind, 1991). Along with high cost, weaknesses of observations include a lack of normative data, the possibility that some low frequency behaviors are missed by certain observational procedures, and that they require extensive training to employ (Guevremont, DuPaul, & Barkley, 1990; Schaughency & Rothlind, 1991).

If possible, several observations in different settings and situations are preferable given that ADHD symptoms vary considerably across situations and times (Landau & Burcham, 1996). In general, however, it is recommended that the child be observed in the setting where the symptoms are most prominent. This is made necessary by the fact that ADHD symptoms are often not seen in the office setting (Copeland & Wolraich, 1987; Pennington, 1992; Silver & Brunsletter, 1986; Sleator and Ullmann, 1981).

As a primary complication of ADHD is school failure (American Psychiatric Association, 1987), classroom observations are suggested to be especially important (Morriss, 1992). Regarding classroom observations Barkley (1990) concludes: "Such observations are likely to prove as useful as (or more useful than) any other sources of information in the evaluation, because they directly assess the actual ADHD symptoms of concern to the child's teacher" (p. 339). In-class observations correlate highly with teacher ratings of ADHD symptoms, as well as with measures of academic accuracy and productivity (DuPaul, 1990).

Recommended observation approaches include both anecdotal (Parker, 1992) and systematic (Barkley, 1990) strategies. Landau & Burcham (1996) report that no single observation system is considered appropriate for all cases. Instead the method chosen (e.g., interval time sampling, duration, event recording) should depend upon the types of concerns present.[5]

Laboratory and Psycho-Educational Tests. While some have argued that laboratory procedures ". . . should not be used to diagnoses ADHD" (Schaughency & Rothlind, 1991, p. 197), most sources reviewed advocate some use of structured norm referenced psycho-educational tests (see Table 2 for references). Typically administered by a mental health professional, these procedures attempt to directly assess the child's attentional capacity and explore other psycho-educational variables. While there may be some disagreement regarding the efficacy of laboratory measures, no source reviewed for this article argue against psycho-educational tests as an aid for identifying alternative explanations for ADHD symptoms.[6]

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[5] The reader is encouraged to refer to Parker (1992) and Barkley's (1990) discussions of direct observation for more information regarding specific techniques.

[6] The reader is encouraged to refer to Barkley (1990) and Goldstein and Goldstein (1990b) for additional discussion of clinical measures of attention.

Reasoning offered to help explain why laboratory procedures are not as widely endorsed as other diagnostic strategies include poor test standardization, the lack of procedures developed and normed specifically for ADHD diagnosis, the high rate of false positives and negatives, and the fact that there is no "pure" measure of attention (Barkley, 1990, 1991, 1994; Goldstein & Goldstein, 1990b). Also, Landau and Burcham (1996) question the ecological validity of laboratory procedures. Nevertheless, the past decade has seen a significant progress in attempts to develop more objective means of assessing ADHD (Barkley, 1990).

Currently, it would appear thatthe most useful laboratory measures are continuous-performance tests (CPT) (Goldstein & Goldstein, 1990b). CPT are the most frequently studied and used laboratory measures of vigilance or attention and impulse control (Barkley, 1991; Guevremont, DuPaul, & Barkley, 1990). First developed by Rosvold, Mirsky, Sarason, Bransome, & Beck (1956), CPT typically require a child to listen to or look at a series of numbers or letters and to respond in some way (e.g., pressing a button) whenever a certain stimuli or pairs of stimuli are presented. Scores are typically based on the number of correct responses, errors of omission, and errors of comission. The Gordon Diagnostic System (Gordon, 1983) is an example of a recent CPT developed specifically for the purpose of ADHD diagnosis. While acknowledged as a helpful diagnostic aid, Swanson (1992) cautions that CPT should not be used as the sole source of ADHD diagnostic information.

Some authors suggest that intelligence testing may be useful in diagnosing this disorder. Specifically, Goldstein and Goldstein (1990a, 1990b) have suggested that the Mazes subtest from the *Wechsler Intelligence Scale for Children - Revised* (Wechsler, 1974) is sensitive to impulsivity. Similarly, Lufi and Cohen (1985), and Kirby and Grimly (1986) have offered that children with ADHD score significantly lower on the Digit Span, Coding, and Arithmetic subtests than those without this disorder. However, conflicting evidence regarding the discriminative powers of this procedure is offered by Barkley (1990). He cites recent research that this Freedom from Distractibility factor is unable to distinguish children with ADHD from either learning-disabled or normal children.

Observation of test taking behavior has also been suggested to be diagnostic (Goldstein & Goldstein, 1990b). Recent research has shown that observations of children being administered a CPT may be as sensitive to discriminating ADHD children from other diagnostic groups as are the CPT scores (Barkley, 1990). During testing ADHD children typically make more careless and impulsive errors (Goldstein & Goldstein, 1990a; Sattler, 1988). Additionally, they may find it difficult to sit still, display concentration difficulties over a sustained period of time, and may be distracted by events occurring outside the testing room. Test performance is often characterized by oversights, such as omissions or insertions, or misinterpretation of easy items when well motivated (not just when completing tasks that hold little intrinsic value).

Finally, as has already been mentioned, an unquestioned purpose of psychometrics is in the evaluation of problems associated with ADHD. For example, assessment of cognitive and academic functioning is often recommended (Goldstein & Goldstein, 1990b; Hinshaw, 1994; Landau & Burcham, 1996; and Parker, 1992). Intelligence testing may help in the identification of conditions which commonly co-exist with ADHD, or that may serve as a competing explanation for observed symptoms. For example, when combined with achievement and perceptual processing measures, the intelligence test will allow for the diagnosis of specific learning disabilities (Barkley, 1990; Lin-Dyken & Wolraich, 1991; Hunsucker, 1988). Additionally, intelligence test results serve to identify the developmental delays and intellectual precocity that may cause inattention.

Medical Evaluation. Several authors suggest the medical evaluation to be an essential component of the ADHD diagnosis (see Table 2 for references). It typically includes a medical interview and physical examination. From this evaluation the need for diagnostic medical testing may be determined (Goldstein & Goldstein, 1990b). Although the medical evaluation is by itself inadequate to diagnosis ADHD, the physician has several diagnostic tasks to accomplish (Barkley, 1990).

The first task is to identify medical conditions that may have caused ADHD symptoms. For example, in certain cases ADHD can arise secondary to a biologically compromising event. These events

may include severe Reye's syndrome, hypoxic-trauma (e.g., near-drowning or severe smoke inhalation), head trauma, central nervous system infection, or cerebral-vascular disease (Barkley, 1990). Fetal postmaturity, long labor, maternal toxemia and frequent ear infections have also been associated with ADHD (Goldstein & Goldstein, 1990b).

The second task is to identify medical conditions associated with ADHD symptoms that may require treatment in their own right. When suspected to be present these conditions may require additional medical diagnostic tests. These conditions include vision and hearing problems, hyper- or hypothyroidism, lead poisoning, iron-deficiency anemia, pinworms, sleep apnea, or other chronic illnesses (Barkley, 1990; Goldstein & Goldstein, 1990b; Lin-Dyken & Wolraich, 1992). A seizure disorder is an example of a problem that may cause ADHD-like symptoms. The staring spells often seen in petit mal epilepsy can be confused with ADHD. The child referred for ADHD who presents with staring spells as a major symptom is an example of a circumstance where diagnostic testing (i.e., an EEG) is critical. Typically, however, the medical interview and physical examination are able to exclude conditions such as those mentioned above, and extensive medical diagnostic testing is rarely needed to diagnosis ADHD (Goldstein & Goldstein, 1990b).

It is suggested that the medical examination is especially critical for children with histories of a seizure disorder and/or asthma. As many as 30% of children with a seizure disorder may develop ADHD or have its symptoms worsened with anticonvulsants such as Dilantin or Phenobarbital (Wolf & Forsythe, 1978). Similarly the medication Theophylline, used to treat asthma, is reported to affect attention span and may exacerbate a preexisting case of ADHD (Barkley, 1990; Parker, 1992).

The final suggested purpose of the medical exam is to determine if there are physical conditions that would contraindicate treatment with stimulant medications. For example, in the case of a child with a personal or family history of a tic disorder or Tourette's syndrome use of stimulant medication should be carefully considered. This is important given the possibility stimulants may exacerbate this disorder's symptoms. Additionally, a history of high blood pressure or heart problems means that stimulant medication should be carefully considered as these medications are known to have an effect on the cardiovascular system (Barkley, 1990; Goldstein & Goldstein, 1990b; Parker, 1992).

Review of School Records. Examination of school records has also been suggested to be helpful (see Table 2 for references). Typically, ADHD children will have evidenced difficulties with on-task behavior throughout their school careers. In fact, as was previously mentioned, DSM IV criteria require symptoms manifest themselves before age seven (American Psychiatric Association, 1994). Review of school records, such as report cards, will yield information regarding when symptoms were first observed. These records also provide data on the types of symptoms observed and their severity over time (Goldstein & Goldstein, 1990b). Specifically, they provide information on a child's work habits, task completion skills, & restlessness (DuPaul, 1992).

Peer Assessments. Peer nominations and peer ratings are another set of procedures suggested to be useful in the diagnosis of ADHD (see Table 2 for references). The utility of these procedures is based upon the well-documented social difficulties experienced by ADHD children (Whalen & Henker, 1985) and that the severity of these difficulties are an indicator of eventual adolescent and adult outcome (Hinshaw, 1994; Weiss & Hechtman, 1986). Peer nominations typically require children to nominate those classmates whom they like the most, and those whom they like the least. Atkins and Pelham (1991) report that ADHD children are usually rated less popular and more disliked than children without this disorder. Peer ratings, on the other hand, obtain from classmates information regarding specific behaviors that lead to rejections, neglect, and popularity. Regarding these procedures, Schaughency and Rothlind (1991) suggest that ". . . peers are able to identify attention problems among their classmates who are referred for adjustment difficulties and to differentiate among their classmates who are referred for adjustment difficulties and to differential among the externalizing behavior problems of their classmates" (p. 196).

Conclusion

In concluding this review, it needs to be emphasized that the diagnosis of ADHD is a matter of an educated opinion. There is no single psychological or medical test recommended for use in diagnosing ADHD. Further compounding this problem is the fact that there are a number of other factors or conditions that may either serve as alternative explanations for ADHD symptoms, or may co-exist with this disorder. From this review of the literature it would appear that these diagnostic hurdles can be overcome by a multidisciplinary team of qualified professionals (i.e., medical, psychological, and educational), making use of multiple information sources (which must include the parent and should include the classroom teacher), and multiple diagnostic procedures (i.e., rating scales, interviews, observations, psychometric testing, medical evaluations, peer ratings and record review).

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